

A Report to the California Coastal Commission and the United States Navy

On

The Coastal Effects of Radar Emissions from the Navy's Surface Warfare Engineering Facility at Port Hueneme, California

Submitted by the

**Coastal Programs Division
Office of Ocean and Coastal Resource Management
National Ocean Service
National Oceanic and Atmospheric Administration**

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Introduction

This document contains a report by the Coastal Programs Division of the Office of Ocean and Coastal Resource Management (OCRM) to the California Coastal Commission (Commission) and the United States Navy on the coastal effects of radar emissions from the Navy's Surface Engineering Warfare Facility (SWEF) at Port Hueneme (pronounced WHY-KNEE-ME), California. OCRM is the federal agency responsible for the administration of the federal Coastal Zone Management Act (CZMA) (16 USC §§ 1451 to 1465) and is part of the National Ocean Service, within the National Oceanic and Atmospheric Administration, U.S. Department of Commerce. OCRM appreciates the opportunity to assist the Commission and the Navy in this matter.

Charge to the Panel

The five technical panel members were charged with providing, to the Navy and the Commission, through OCRM, their independent and objective scientific evaluation on whether, and to what extent, the operation of the SWEF poses impacts to any land or water use or natural resource of the coastal zone or impacts safe public access to the coastal zone. To assist the panel members in making their evaluations, OCRM provided materials that were agreed upon by the Commission and the Navy. The panel participated in discussions with the Navy, the Commission, the Citizen Observer, and OCRM on December 14, 1999, in Ventura California. In their participation, the panel members were not representing or working for OCRM, the Navy or the Commission. The panel members are not and were not an advisory or consensus group, but provided their own independent views.

Coastal Effects - Summary of Panel Members' Evaluations

This section summarizes the evaluations by the technical review panel, which are included in appendix 2. A brief general summary is provided, followed by a summary for each of the five panel members. Some of the summaries contain recommendations for consideration by the Navy and the Commission. The summaries and the panel members' evaluations are ordered alphabetically. The length of a particular panel member's summary, relative to the other summaries, is not an indication of importance or weight. The length of the five summaries varies merely to capture the main points of the different evaluations. All five evaluations, and summaries, should be accorded equal weight.

General Summary - The panel members found that the operation of the SWEF, including its radiofrequency emissions, *in accordance with the Navy's described operational and safety guidelines*, do not, *generally*, pose impacts to any land or water use or natural resource of the coastal zone and do not represent a public health risk. Some of the panel members stated that there may be health or exposure risks to people on vessels transiting or anchoring in the harbor. Most of the panel members recommended steps the Navy can, or should, take to further ensure that the operation of the SWEF is safe, that the Navy's operational and safety guidelines are carefully adhered to and monitored and that radiofrequency measurements in the uncontrolled (off-base) environment are adequate to continue to assess the impact of the radiofrequency emissions. These recommendations are provided after the applicable panel member's summary.

Summary of Each Panel Member's Evaluations

Dr. Ross Adey - Overall, from the data provided to the Panel by the Navy, the SWEF operation is in general compliance with DoD Directive 6055.11, with the notable exception that ships entering and leaving Pt. Hueneme Harbor may be transiently exposed to field levels above the PEL while under way. They may be more severely exposed if remaining anchored for extended periods at certain sections of the harbor entrance. At least three major considerations affect a determination of potential health risks for Navy personnel in controlled environments and for civilian residents in adjoining housing developments.

1. Available epidemiological studies offer supporting evidence for dose-dependent effects of cumulative microwave exposure over many years.
2. Adverse health effects have been reported with microwave fields at mean incident power levels below tissue heating thresholds.

3. In the absence of tissue heating as the vehicle for observed adverse microwave bioeffects, further medical microwave research will be necessary to determine the role of peak pulse power and pulse repetition frequencies.

The U.S. Radiofrequency Interagency Working Group (RFAIWG) has identified needed changes and updates in current microwave safety guidelines. They include: (1) selection of an adverse effect level for chronic exposures not based on tissue heating and considering modulation characteristics, and peak intensities not associated with tissue temperature elevation; (2) recognition of different safety criteria for acute and chronic exposures at athermal levels; (3) recognition of defects of time-averaged dosimetry that does not differentiate between intensity-modulated RF radiation exposure and CW exposure, and therefore not adequately protecting the public.

Recommendations:

- Complete 360° rotation of any SWEF radar system should no longer be permitted.
- Antenna mobility should be limited to seaward sectoring, with sector margins determined by coordinates of coastline intercepts. Under no circumstances should antenna traverses across adjoining coastal zones be permitted.
- The Navy should issue a general warning to mariners not to remain in a zone extending seaward 2 miles from the SWEF base, with eastern and western margins defined as in recommendation 2, above.
- The Navy should provide, annually, to NOAA, or to a Federal agency designated by NOAA, complete logs of activity in all SWEF radar systems. These reports should include all epochs of operation, the duration of each epoch, and the limits of antenna sectoring.
- DoD should review and implement, in a timely manner, any new safety guidelines developed by RFAIWG in conjunction with ANSI for protection of the public.
- Until new Federal safety guidelines now under consideration by RFAIWG are implemented, no blanket approval of the SWEF operation should be affirmed.

Dr. Robert C. Beason - The “bottom line” is that the Navy is operating within the safety guidelines and the SWEF does not present any hazard to civilians in the public areas. The only potential problem would be if an extremely tall ship came into the harbor, but the harbor is probably not capable of handling such a vessel. There is a potential hazard for wildlife, i.e., birds, that might occupy the roof of the buildings while the antennas are emitting a signal. It is possible that the movement of the antennas would flush the birds away.

Recommendation: The Navy might want to mount a camera on the roof of the SWEF or otherwise monitor the roof to verify that birds are not roosting in front of operating transmitters.

Dr. John D’Andrea - Under applicable Department of defense and IEEE/ANSI guidelines, the emissions from the SWEF pose no hazard to people or wildlife that are in the public access area of the coastal zone surrounding the SWEF. The main SWEF beams are restricted to heights well above the public and shipping

areas and do not pose a hazard. The small fraction of energy from beam “sidelobes” that may reach the public beaches or waterways are below applicable guidelines and are not a hazard in these areas. The controls proposed by the Navy seem very reasonable.

Recommendations: None.

Dr. Joe A. Elder - The Navy surveys show that public exposures at ground or water levels outside the base perimeter are below 1 mW/cm² and I conclude that these surveys show no significant public health risk at these publically accessible locations from exposure to radiofrequency radiation from the SWEF radars. The Navy reports show that a special case of potential public exposure in excess of the general population limit of 1 mW/cm² exists on the superstructure of cargo ships in the Port Hueneme ship channel. Safety procedures can ensure safe exposure levels on ships and permit the Navy to fulfill the SWEF mission. Also, the Navy’s public exposure data is the minimum necessary to reach these conclusions on the public health impact with my confidence rating of “adequate.” Public health evaluations with a higher confidence rating, such as “very good” to “excellent,” would enhance the public’s reception of the evaluations and be more helpful to public health officials.

Recommendations:

- When cargo ships are stationary in the shipping channel in front of the SWEF, or in front of the SWEF during transit through the channel, safeguards should prevent energization of SWEF radars that produce power densities of 1 mW/cm² or greater on cargo ships.
- The Navy should submit to the public [through the Commission] a well-designed, comprehensive public exposure assessment study within a reasonable time, e.g., six months, after submission of OCRM’s report to the Commission.

Mr. Edwin Mantiply - If the SWEF is following the engineering and procedural controls as specified in Navy documents, the SWEF should not represent a health risk or affect the offsite environment. It is possible for the SWEF radars to exceed safety limits if used contrary to the Navy’s operating guidelines. Thus, it is incumbent on the SWEF facility to ensure that active radars are not pointed in any direction that causes exposures to exceed safety limits. Procedural controls may be necessary to prevent illumination of transiting ships resulting in exposure to shipboard personnel and possibly unacceptable reflections. Engineering controls that would prevent these exposures are apparently impractical.

Recommendations:

- The Navy should designate a microwave safety officer to ensure compliance with safety measures.
- The Navy should provide for simple harbor and channel observation and appropriate operator clearance to transmit.

Background

The Navy operates the SWEF, which is a radar testing and training facility. The SWEF tests the Navy’s various radars and simulates combat scenarios to test a ship’s combat systems. In conducting these tests,

the radars use high frequency radar emissions. The SWEF is used to support the continued improvement of combat and weapon systems in terms of safety, reliability (and consequently, availability), maintenance requirements, operational capabilities, and performance. The equipment installed at the SWEF allows ships' combat systems to be tested, evaluated, and changed without requiring installation onboard ships or equipping a laboratory at sea. Obtaining fleet support from ships is very difficult and expensive, and it requires extensive lead-time to schedule. Using the SWEF provides a cost-effective means of providing realistic, verifiable surface combat and defense systems data to the Navy surface fleet, U.S. Coast Guard, and some foreign navies. It is estimated that performing these engineering and development tasks at the SWEF instead of using fleet resources saves the Navy over \$13 million each year.

The Commission is concerned that the radar emissions may pose public health risks and may affect coastal uses and resources (public access near the SWEF, coastal shipping, commercial and recreational fishing, and wildlife). The Navy does not believe that the SWEF poses public health risks or causes coastal effects.

The Commission implements California's federally-approved CZMA Coastal Management Program. The Commission requested that the Navy provide, pursuant to the CZMA federal consistency requirement (16 USC § 1456(c)(1) and 15 CFR part 930, subpart C), a consistency determination and other information for the SWEF. The Navy declined and, instead, provided the Commission with negative determinations, pursuant to 15 CFR § 930.35(d). The Navy determined that negative determinations met the requirements of the CZMA in this instance; accordingly, the Navy provided negative determinations for the installations of TARTAR Mk 74 Mod 6/8, the Aegis SPY-A, the AEGIS Mk 99 Director, SBQ-99 Radar, and the TISS System. See Appendix 1 for brief descriptions of the CZMA and the CZMA federal consistency requirement.

In November 1998, the Commission requested that OCRM informally mediate the matter. The Navy agreed to participate in informal negotiations. The purpose of the informal negotiations is to assist the Commission and the Navy in determining, relying on input from an independent and objective technical panel, whether radar emissions from the SWEF will adversely affect the public's use of coastal resources and the resources themselves.

Participants

The mediation parties are the Commission and the Navy. OCRM is the mediator. By agreement of the parties, OCRM obtained the participation of five experts in radar emissions to assess the coastal effects of the SWEF. These five experts comprised the technical review panel. OCRM, the Commission and the Navy were fortunate to have the input from five experts who are highly respected nationally and internationally. The panel members volunteered their time, in the midst of their very busy schedules. The panel members were diligent, engaged and well-prepared for our discussions. Their expertise was clearly evident. On behalf of OCRM, the Commission and the Navy, we greatly appreciate and thank the panel members for their time and assistance, and their institutions: U.S. Environmental Protection Agency, Brooks Air Force Base, University of California Riverside, and State University of New York at Geneseo.

In addition, the Commission chose a Citizen Observer to participate in the panel's review process. The Citizen Observer, Lee Quaintance, is from a community nearby the SWEF. Special thanks go to Mr. Quaintance for providing thoughtful and useful information and input during the panel process.

The participants in the mediation and panel discussions were:

OCRM	Mr. Jeffrey R. Benoit Director	Mr. David W. Kaiser Federal Consistency Coordinator
Commission	Mr. Mark Delaplaine Federal Consistency Supervisor	Mr. Dan Olivas California Attorney Generals Office
Navy	Ms. Suzanne Duffy Deputy Director, Technical Operations Naval Surface Warfare Center HQ Ms. Jeanne Prussman, Assistant Counsel, Naval Sea Systems Command Office of Counsel	Mr. Chuck Hogle System Engineer Ms. Vickie Witt, Environmental Program Manager, Naval Sea Systems Command
Panel Members	Dr. Ross Adey University of California Riverside Dr. John A. D'Andrea Chief Scientist Naval Health Research Center Brooks Air Force Base Dr. Edwin D. Mantiply National Air and Radiation Environmental Laboratory, U.S. EPA	Dr. Robert Beason State University of New York, Geneseo Dr. Joe A. Elder Special Assistant National Health and Environmental Effects Research Laboratory, U.S. EPA
Citizen Observer	Mr. Lee Quaintance Oxnard, California	

Charge to the Panel

The panel members were charged with providing, to the Navy and the Commission, through OCRM, their independent and objective scientific evaluation on whether, and to what extent, the operation of the SWEF poses impacts to any land or water use or natural resource of the coastal zone or impacts safe public access to the coastal zone. Panel members, in making their evaluations, used the materials provided by OCRM, as agreed to by the Commission and the Navy. Panel members were not representing, advising, contracting with or otherwise working for OCRM, the Navy or the Commission. Panel members were not acting as an advisory or consensus group, but provided their own independent views.

The Process

OCRM obtained the participation of the panel members during the Spring and Summer of 1999. OCRM provided to the panel members a package of materials for their review. The panel members received the information between August and September 1999. The review package was agreed to by OCRM, the Commission, the Navy, with substantial input by the Citizen Observer. The documents included:

- **Questions to Guide the Panel Members' Assessments.** These questions are from OCRM's memorandum to the Commission and the Navy (Nov. 6, 1998) and are the questions that the Navy answers in a letter to OCRM (Dec. 14, 1998).
- **Navy's Response to SWEF Questions.** This document, a letter from J.W. Phillips, Navy, to David Kaiser, OCRM (Dec. 14, 1998), provides the Navy's response to the above questions.
- **The Beacon Foundation's Response to the Navy's Response to SWEF Questions.** This document responds to the Navy's December 14, 1998, response to the above SWEF questions. The Beacon document is dated January 5, 1998, but it is actually a January 5, **1999**, document.
- **Background Material from the Commission.** This document, a memorandum from Mark Delaplaine, Commission, to Interested Parties (Sep. 15, 1998), contains a more detailed description of the issues between the Commission and the Navy and includes several background attachments. Attachment 3 of Delaplaine's September 15 memorandum contains the Radiation Hazard Reports of 1989, 1994, 1996, and 1997. Classified versions of these reports were provided to the panel members who hold proper clearances (Ed Mantiply and John D'Andrea).
- **RadHaz Survey of December 1998.** This document is a survey conducted by the Navy for the AN/SPQ-98 and MK-99 radars.
- **Three Beacon Memoranda, Dated April 3, 1999, August 20, 1997, and October 27, 1997.** These memoranda provide additional information on the Navy's documentation of effects from the SWEF.
- **Two One-Pagers on the CZMA and the CZMA Federal Consistency Requirement.** These two documents provide the Panel members with a brief description of the CZMA program and the CZMA federal consistency requirement, under which the Commission is able to review the SWEF facility.

The Panel members began their reviews of the material in September-October 1999. In October, all participants agreed that the panel would review the materials during the rest of the Fall and meet in December to discuss the materials and the panel members' preliminary findings. The group listed in the above participant's chart met on December 14, 1999. The meeting started with a tour of the SWEF at Port Hueneme and a welcome by the SWEF Commanding Officer, Captain James W. "Stretch" Phillips. The group then observed the facility from the nearby community and beach and La Jenelle Park. The group then met for the rest of the day at the Commission's offices in Ventura.

At the December 14 meeting, the group discussed preliminary findings for each of the questions provided to the panel. These questions are repeated below. At that time, the panel members requested additional information. The Navy provided this information to the panel in January and February 2000, which included: (1) a to-scale map of the SWEF and surrounding area, (2) classified versions of appendices D and E of the 1997 Radiation Hazard Survey to the two panel members with appropriate clearances (Ed Mantiply and John D'Andrea), and (3) information regarding the diameter of the antennas and peak power levels. Subsequently, one panel member asked for further information on antenna azimuth and patterns, which the Navy provided in February. In addition, Ed Mantiply provided his calculations regarding some dish dynamics to his fellow panel members for their consideration. The panel members submitted their findings to OCRM in February and March 2000, and are included, unedited for content, in Appendix 2.

Following receipt of the panel members' evaluations, OCRM submitted a draft of this report to the panel members, the Commission, the Navy and the Citizen Observer for comment. No changes were made to the panel members' evaluations or summary of their evaluations unless specifically agreed to by the applicable panel member. Following receipt of comments, OCRM revised and finalized the report for submission to the Commission and the Navy.

OCRM, the Navy and the Commission agreed that the questions listed below should be answered. These questions were provided to the Panel. Some Panel members used this format, while others provided their own narrative.

1. Do the radar frequency (RF) emissions from the SWEF pose a risk to people who use coastal resources?

In answering this question, the following questions should also be considered:

1.a. Do the SWEF RF emissions affect public access and recreation at public beaches and La Jenelle Park, coastal shipping, or commercial or recreational fishing?

1.b. What is the maximum level (and duration) of foreseeable exposure that could be received by a shipboard person?

1.c. Does the evidence support the Navy's conclusion that no harmful exposure could occur on a nearby ship (including transiting ships, moored ships, dredging ships, fishing vessels, etc.)?

1.d. How does the lowered height of the radar on Building 5186 affect exposure calculations to ships and public areas?

1.e. Can reflection of SWEF radar emissions off metal ship structures focus and intensify exposure?

2. Is there potential for adverse effects on wildlife from SWEF radar emissions?

3. What is the baseline worst case scenario for SWEF radar emissions in the uncontrolled environment?

In answering this question, the following questions should also be considered:

3.a. What are the maximum RF levels that could be emitted at the same time and what would be the effect of such levels on the uncontrolled environment?

3.b. What are the maximum RF levels that could be directed at a particular point, i.e., a shipboard person, and what would be the effect of such levels on a point in the uncontrolled environment?

3.c. What are the expected operational maximum RF levels and what effect would such emissions have on the uncontrolled environment?

3.d. Are multiple source RF emissions a factor in any worst case scenario (i.e., a ship moving through several radar beams)?

3.e. What is the distinction between RF emission capabilities “as installed” versus “as operated?”

3.f. What controls are in place to ensure that an RF standard is not exceeded?

3.g. What are the consequences to people in the uncontrolled environment if an RF standard was exceeded by various percentages? Are there thresholds above an RF standard that the Commission could use to determine whether the Commission should be concerned?

4. How will the Navy interact with the Commission in the future?

In answering this question, the following questions should also be considered:

4.a. What technical information should the Navy provide and the Commission seek, and what will be available, in reviewing modifications to the SWEF?

5. With what RF standards does the Navy comply? What do those standards mean? What is the status of evolving international RF emission standards and would the international standards be useful in determining whether SWEF RF emissions pose a risk to coastal users? How will the Navy respond if/when the international standards change?

6. How do SWEF RF emissions compare to other radar emissions?

7. To what extent is the Navy, in response to these questions, relying on information that is not available to the public?

Appendix 1 - Description of CZMA and Federal Consistency

The CZMA. The CZMA, enacted in 1972, created a national coastal management program to

comprehensively manage competing uses of and impacts to coastal uses and resources. The CZMA's objectives describe the importance of the coastal zone for its variety of natural, commercial, recreational, ecological, industrial and esthetic resources; the variety of these resources to the nation; and the need to preserve, protect, develop and restore or enhance these resources for this and succeeding generations. The CZMA defines and authorizes the Coastal Zone Management Program and the National Estuarine Research Reserve System. It is the only national authority that works with all sectors of government to comprehensively manage and address the many and increasing pressures on the use of our coastal areas and our coastal and ocean environments.

This program is implemented by state Coastal Management Programs (CMPs) and National Estuarine Research Reserves (NERRs) in partnership with the federal government. Eligible states may develop CMPs and NERRs pursuant to federal requirements. Thirty-three states have approved CMPs. Of the two remaining eligible states, Indiana is developing a program and Illinois is not currently participating. There are twenty-four federally designated NERRs in eighteen states. Five additional reserves are in development. The CZMA program is administered by the Office of Ocean and Coastal Resource Management, which is part of the National Ocean Service, National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce.

As part of federal approval of the state CMPs and NERRs, state CMPs and NERRs receive annual operating funds through cooperative agreements with NOAA. These funds are used by state agencies and local governments for a variety of management, research, permitting, enforcement, education and project specific activities.

Federal Consistency. The federal consistency requirement (CZMA § 307) is a primary incentive for states to join the national coastal management program. It is a powerful tool that states use to address effects on coastal uses or resources that are the result of federal actions. Federal consistency also helps to avoid conflicts between states and Federal agencies by fostering cooperation, consultation and coordination.

Federal consistency requires that federal actions, in or outside the coastal zone, that affect any coastal use or resource must be consistent with the enforceable policies of state CMPs. This "effects test" is the basis of consistency and includes reasonably foreseeable effects. The scope of the effects test is broad and there are no geographical boundaries and no categorical exemptions. While it is a powerful tool, it is important to note that state CMPs concur with 95-97% of all federal actions.

Federal actions include federal agency activities, federal approval activities and federal financial assistance activities. Federal agency activities are activities or development projects proposed by a federal agency (CZMA § 307(c)(1)). Federal agency activities must be consistent to the maximum extent practicable with the enforceable policies of a state's CMP. Enforceable policies are state CMP policies that are legally binding under state law and approved by NOAA. Consistency can help build support for federal actions. Early coordination between state CMPs and federal agencies more often leads to CMP and public support and a smooth federal consistency review. Early coordination

through consistency also helps a federal agency to avoid costly last minute changes to projects in order to comply with CMP enforceable policies.

Federal approval and assistance activities are proposed or undertaken by a non-federal entity, but require federal approval (CZMA § 307(c)(3)) or are applications for federal funding by a state or local government agency (CZMA § 307(d)). Federal approval and assistance activities must be fully consistent with the

enforceable policies of state CMPs.

Appendix 2 - Panel Members' Evaluations

Dr. Ross Adey	A
Dr. Robert C. Beason.....	B
Dr. John D'Andrea.....	C
Dr. Joe A. Elder.....	D
Dr. Edwin D. Mantiply	E

[**NOTE:** To request a copy of the Appendices with the Panel Members' Evaluations, please contact Mark Delaplaine of the Coastal Commission staff at (415) 904-5289, or e-mail at mdelaplaine@coastal.ca.gov]